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JUL 17 1989



# GRADE 12 DIPLOMA EXAMINATION

## Biology 30

June 1989

**Alberta**  
EDUCATION

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**GRADE 12 DIPLOMA EXAMINATION  
BIOLOGY 30**

**DESCRIPTION**

Time: 2½ hours

Total possible marks: 100

This is a **CLOSED-BOOK** examination consisting of two parts:

**PART A:** 70 multiple-choice questions each with a value of 1 mark.

**PART B:** Seven written-response questions for a total of 30 marks.

**GENERAL INSTRUCTIONS**

Fill in the information on the answer sheet as directed by the examiner.

For multiple-choice questions, read each carefully and decide which of the choices **BEST** completes the statement or answers the question. Locate that question number on the answer sheet and fill in the space that corresponds to your choice. **USE AN HB PENCIL ONLY.**

Example	Answer Sheet
This examination is for the subject area of	A    B    C    D
<b>A.</b> Biology	●    ②    ③    ④
<b>B.</b> Chemistry	
<b>C.</b> Mathematics	
<b>D.</b> Physics	

If you wish to change an answer, please erase your first mark completely.

For written-response questions, read each carefully and write your answer in the space provided in the examination booklet.

<p><b>NOTE:</b> The perforated pages at the back of this booklet may be torn out and used for your rough work.</p>
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**DO NOT FOLD EITHER THE ANSWER SHEET OR THE EXAMINATION BOOKLET**

The presiding examiner will collect the answer sheet and examination booklet for transmission to Alberta Education.

**JUNE 1989**



# GRADE 11 DIPLOMA EXAMINATION BIOLOGY 30

DESCRIPTION

Time: 2 1/2 hours

Total possible marks: 67

Part A is a 11-item multiple-choice section consisting of two pages.

Part B is a 20-item short-answer section consisting of two pages.

Part C is a 10-item long-answer section consisting of two pages.

## GENERAL INSTRUCTIONS

1. All the information on the answer sheet is directed by the questions.

2. For multiple-choice questions, you must carefully read each item and its choices. Mark the answer on the answer sheet by writing the letter of the correct choice. Do not write anything on the question paper. If you are unsure of the correct answer, you may mark all the choices. You will receive no credit for this question.

Answer sheet

Example

A B C D

The example is for the subject area of

1. Biology

2. Chemistry

3. Mathematics

4. Physics

5. You may choose to answer questions in any order you wish.

6. For short-answer questions, you must write your answer in the space provided in the question booklet.

7. Do not write anything on the answer sheet or the question booklet. Write your answers in the space provided in the question booklet.

8. Do not write anything on the answer sheet or the question booklet.

9. The following information is for the use of the student. It is not to be used as a reference.

10. The following information is for the use of the student. It is not to be used as a reference.

## **PART A**

### **INSTRUCTIONS**

There are 70 multiple-choice questions with a value of one mark each in this section of the examination. Use the separate answer sheet provided and follow the specific instructions given.

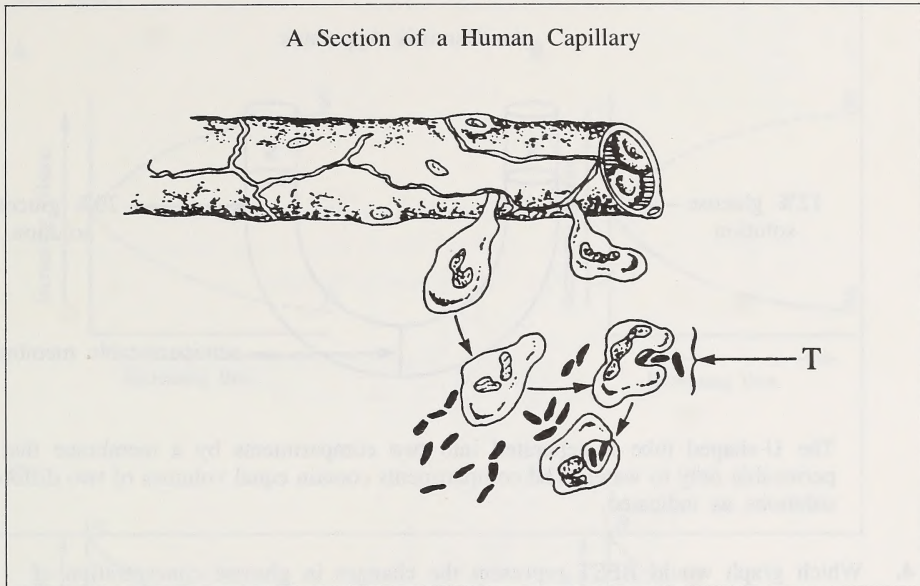
**NOTE:** The perforated pages at the back of this booklet may be torn out and used for your rough work.

**WHEN YOU HAVE COMPLETED PART A, PROCEED DIRECTLY TO PART B**

**DO NOT TURN THE PAGE TO START THE EXAMINATION UNTIL TOLD  
TO DO SO BY THE PRESIDING EXAMINER**

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Use the following diagram to answer questions 1 and 2.

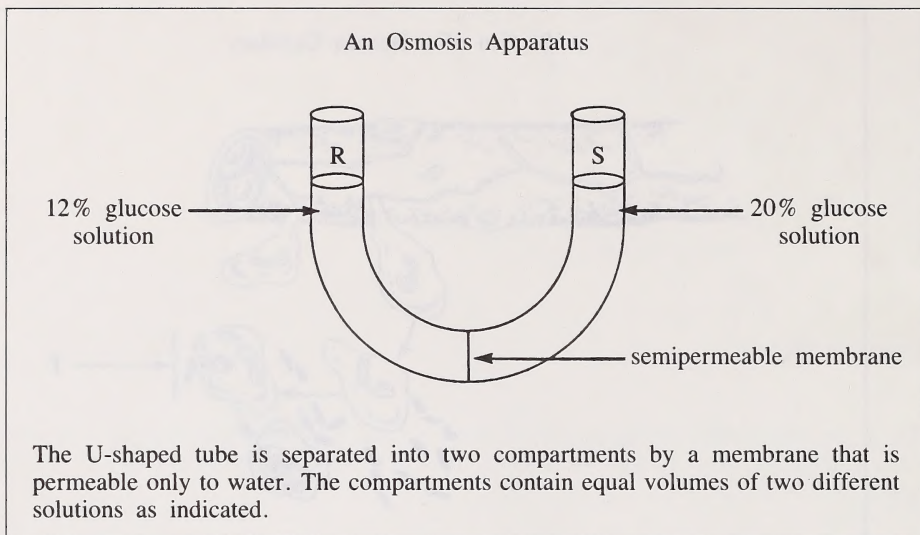


1. In the diagram, the process illustrated at T is
  - A. exocytosis
  - B. pinocytosis
  - C. phagocytosis
  - D. active transport
  
2. The sequence of events shown in the diagram represents a response by the body to
  - A. infection
  - B. blood loss
  - C.  $O_2$  and  $CO_2$  transfer
  - D. absorption of nutrients

---
  
3. A process by which molecules move across cell membranes without the expenditure of energy released from mitochondria is
  - A. osmosis
  - B. endocytosis
  - C. phagocytosis
  - D. active transport

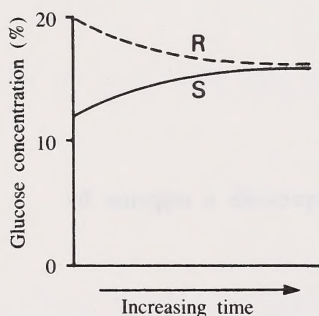


Use the following diagram to answer questions 4 and 5.

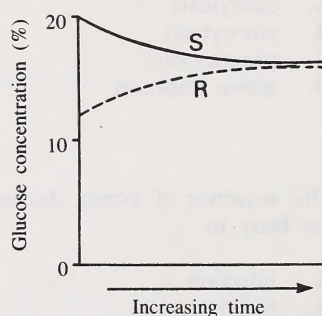


4. Which graph would BEST represent the changes in glucose concentration of solutions R and S over time?

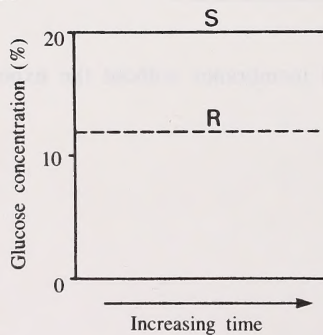
A.



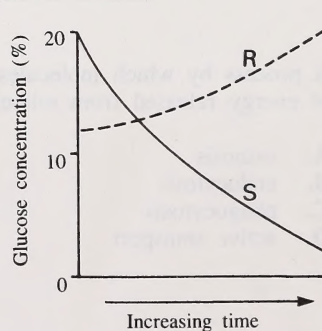
B.



C.



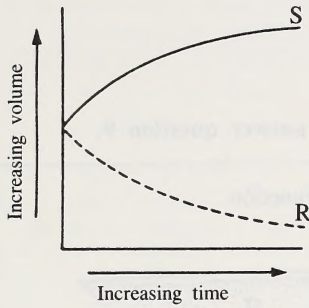
D.



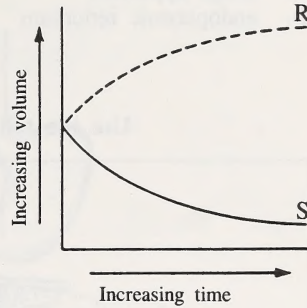


5. Which graph would BEST represent the changes in volume of solutions R and S over time?

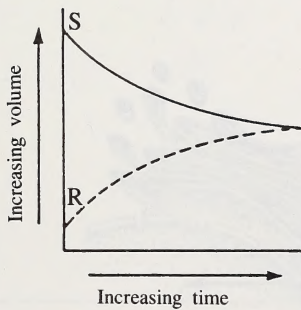
A.



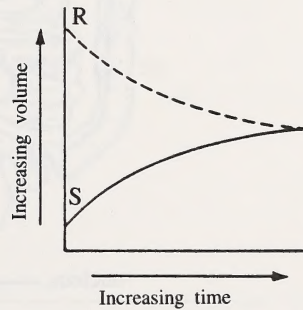
B.



C.



D.



6. Since the liver is a storage organ for the body, which organelle is MOST likely found in great abundance in liver cells?

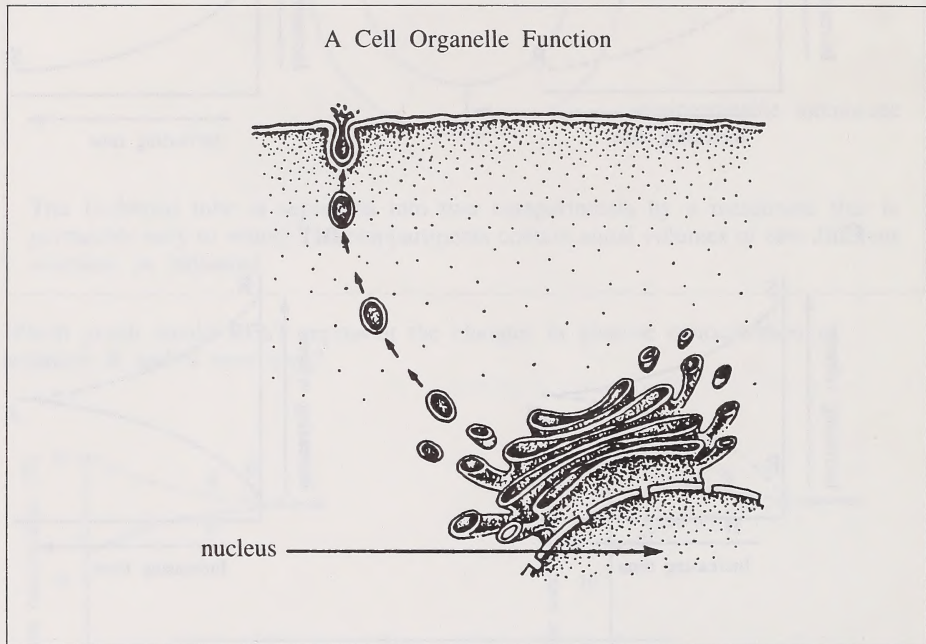
- A. Vacuole
- B. Centriole
- C. Lysosome
- D. Mitochondrion

7. Lack of oxygen in a cell DIRECTLY affects the functioning of the

- A. endoplasmic reticula
- B. mitochondria
- C. ribosomes
- D. lysosomes

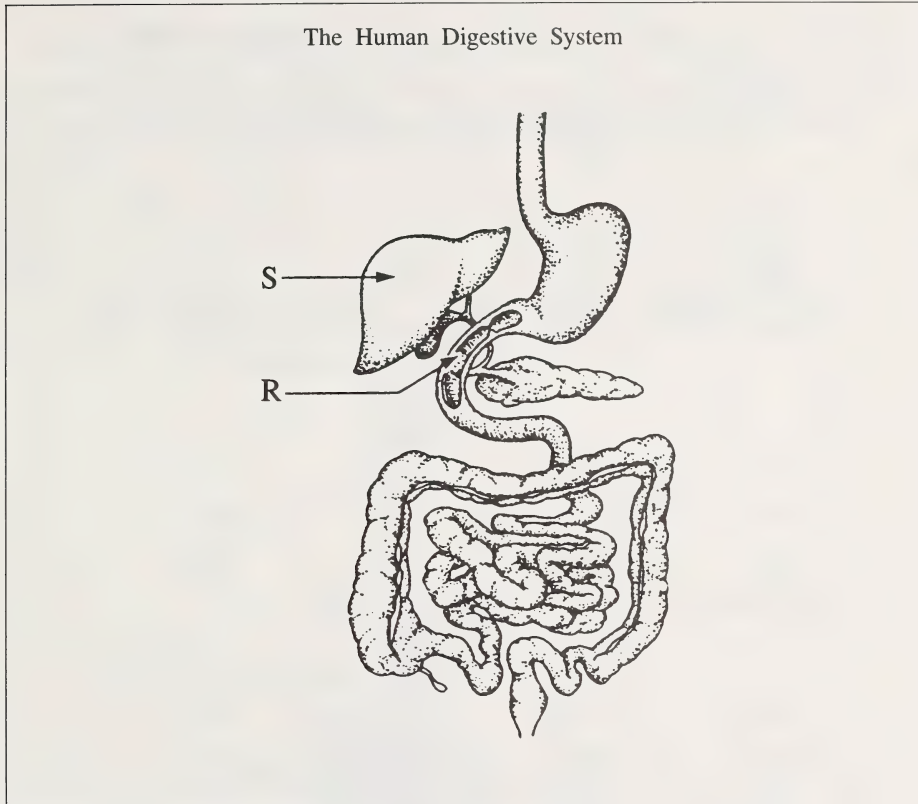
8. A structure that transports chemicals throughout the cytoplasm of a cell is the
- A. ribosome
  - B. mitochondrion
  - C. Golgi apparatus
  - D. endoplasmic reticulum

Use the following diagram to answer question 9.



9. The diagram illustrates
- A. endocytosis by a cell
  - B. phagocytosis by the cell membrane
  - C. production and transport of secretions by the Golgi apparatus
  - D. production and transport of proteins by the endoplasmic reticulum
- 
10. Which chemical substances are broken down MOST readily for use as an energy source in cells?
- A. Lipids
  - B. Proteins
  - C. Vitamins
  - D. Carbohydrates

Use the following diagram to answer questions 11 and 12.

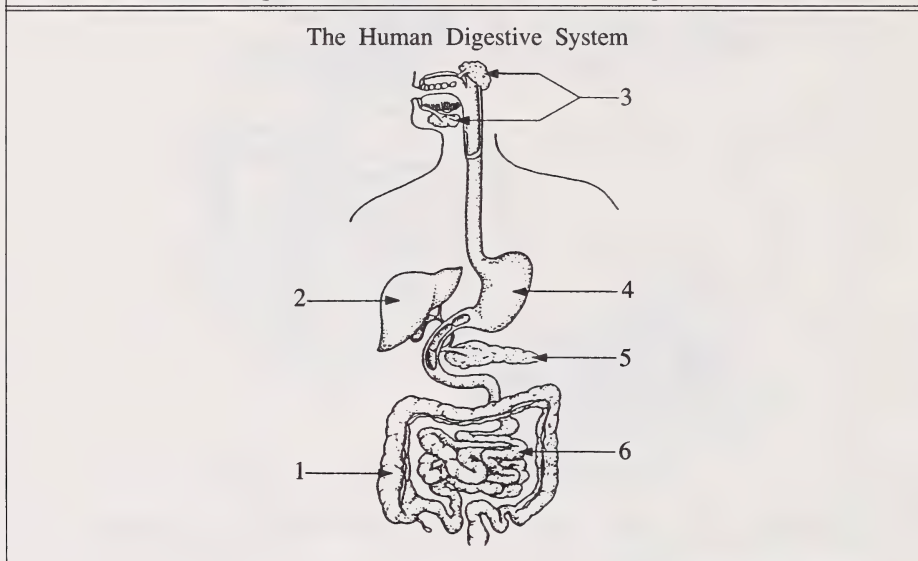


11. A function of the organ labelled S that relates DIRECTLY to digestion is the
- A. production of bile
  - B. storage of vitamins
  - C. production of gastrin
  - D. storage of red blood cells
12. A hormone produced by the structure labelled R that affects the pancreas is
- A. bile
  - B. gastrin
  - C. insulin
  - D. secretin
-

Use the following table and diagram to answer questions 13 and 14.

Results from Indicator Tests of Unknown Substances					
Unknown Substance(s)	Test				
	Benedict's	Iodine	Sudan IV	Translucence	Biuret
I	+	—	—	—	—
II	—	+	—	—	—
III	—	—	—	—	+
IV	—	—	+	+	—

Note: + indicates a positive result      — indicates a negative result

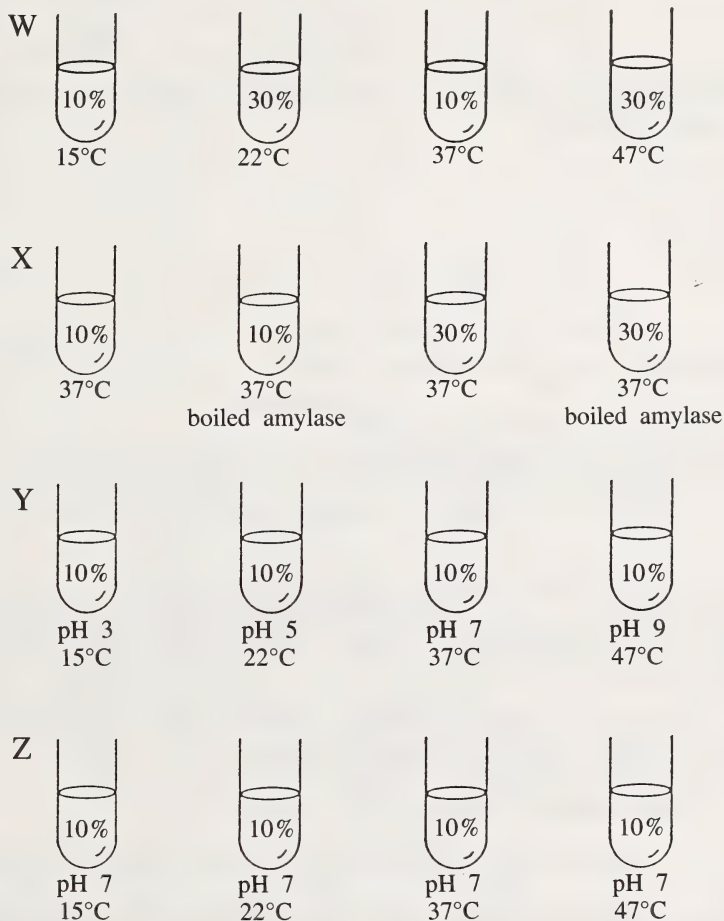


13. The region labelled 4 functions MAINLY in the digestion of which of the substances tested above?
- I
  - II
  - III
  - IV
14. Which of the labelled structures produce one or more enzymes that function in the digestion of Substance II?
- 1, 4, and 6
  - 2, 5, and 6
  - 3, 4, and 6
  - 3, 5, and 6



Use the following information to answer question 15.

Four experiments, labelled W, X, Y, and Z, were designed to test the effect of temperature on the activity of amylase. The four test tubes in each experiment contained 5 mL of a starch suspension at the concentration indicated as well as 1 mL of amylase suspension at a constant concentration. All test tubes and their contents were incubated at the temperatures indicated for 1 h.



15. Which experimental design was MOST appropriate for gathering data about the problem under investigation?

- A. W
- B. X
- C. Y
- D. Z

Use the following table to answer question 16.

Digestive Enzyme	Optimal pH	Substrate
R	7-8	starch
S	7-8	fat
T	1-2	protein
V	7-8	maltose

16. If the amount of gastrin in the blood increases, which enzyme would be released in greater quantities?

A. R  
B. S  
C. T  
D. V

---

17. In an adult, the liver is responsible for the

A. conversion of glycogen to glucose  
B. production of red blood cells  
C. denaturation of glycogen  
D. digestion of proteins

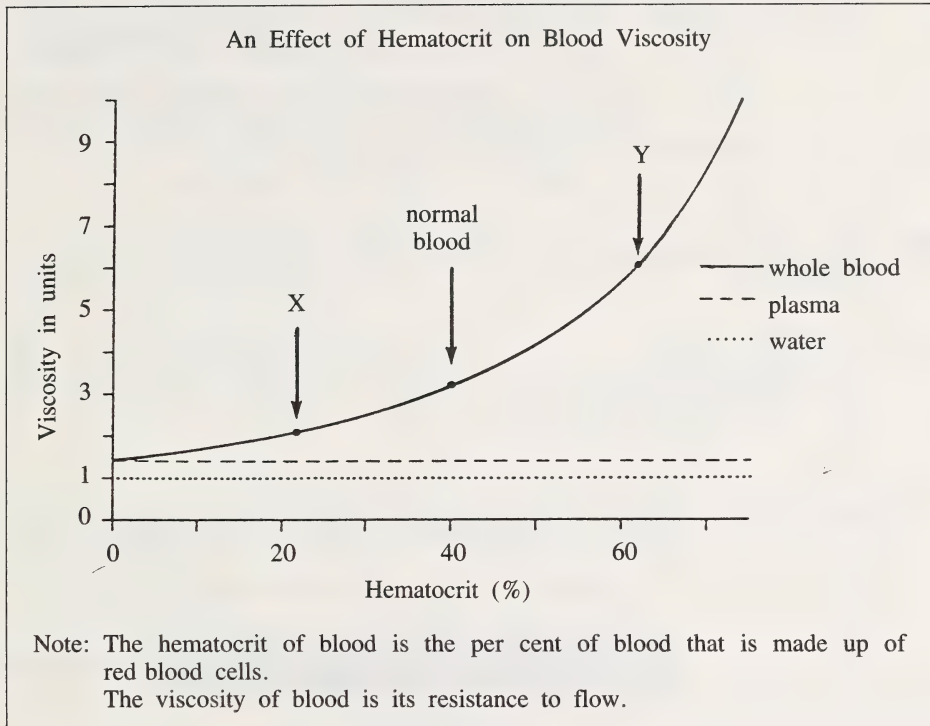
18. Cystic fibrosis is a genetic disease in which there is an overproduction of thick mucus in the digestive and respiratory systems. Which would NOT be a problem associated with this disease?

A. Increased susceptibility to ulcers  
B. Decreased efficiency in digestion of food  
C. Decreased efficiency in absorption of food  
D. Obstruction of the pancreatic and bile ducts

19. Which would MOST likely result from the removal of a substantial part of the large intestine?

A. Incomplete digestion of fat  
B. Reduced reabsorption of water  
C. Incomplete digestion of protein  
D. Reduced absorption of carbohydrates

Use the following graph to answer question 20.



20. If lead poisoning destroys bone marrow, then a person suffering from lead poisoning would have his/her test result plotted at

- A. Y, which indicates blood with a low water content
- B. Y, which indicates blood with a high hematocrit
- C. X, which indicates blood with high viscosity
- D. X, which indicates blood with low viscosity

21. Blood leaving the superior vena cava would proceed in which order?

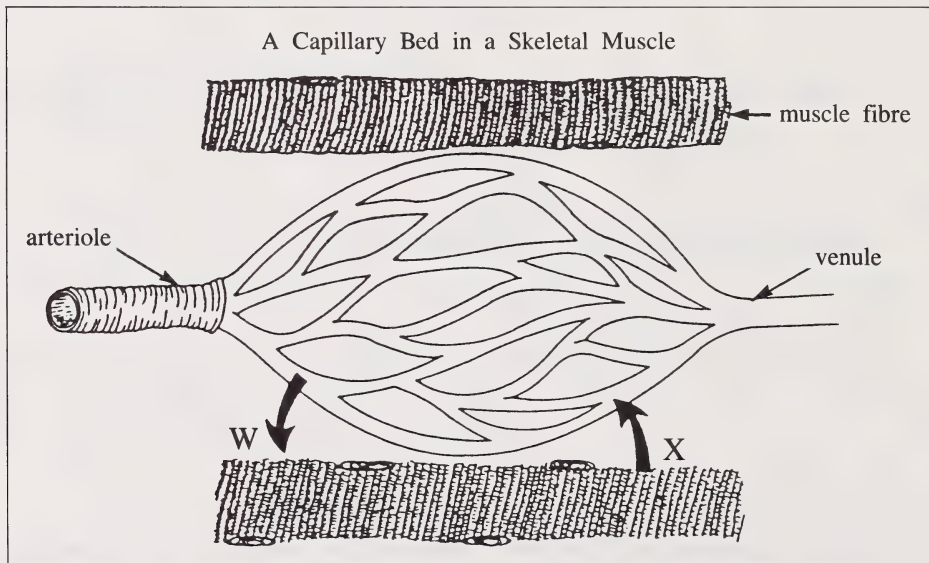
- A. Left ventricle → left atrium → lungs → right ventricle → right atrium → rest of body
- B. Right ventricle → right atrium → lungs → left ventricle → left atrium → rest of body
- C. Left atrium → left ventricle → lungs → right atrium → right ventricle → rest of body
- D. Right atrium → right ventricle → lungs → left atrium → left ventricle → rest of body

Use the following table to answer question 22.

A Comparison of the Blood Hemoglobin Content of Two Subjects	
Subject	Hemoglobin Content (g/100 mL of blood)
W (Normal)	15
X	8

22. The blood hemoglobin content in Subject X will result INITIALLY in an increase in
- A. breathing rate
  - B. plasma production
  - C. blood oxyhemoglobin
  - D. white blood cell production
- 

Use the following diagram to answer question 23.



23. The substance that will move in GREATEST quantity in the directions of BOTH Arrow W and Arrow X is
- A. water
  - B. oxygen
  - C. glucose
  - D. carbon dioxide
-



24. Some doctors are now prescribing medications such as insulin and flu vaccines in the form of nasal sprays and nose drops. The advantages of using these methods include increased convenience and faster absorption. The reason for the rapid absorption of nasal sprays is that the nasal cavity has
- A. a close proximity to the control centres of the brain
  - B. many cilia that will transport the medication quickly
  - C. many odor receptors that absorb the medication
  - D. a high concentration of capillaries in its lining
25. Leukocyte functions include
- A. the transport of  $O_2$  and  $H^+$
  - B. exocytosis and antigen formation
  - C. phagocytosis and antibody formation
  - D. the release of fibrinogen and thrombin
26. People who live at high altitudes for extended periods of time would be expected to have higher
- A. breathing rates
  - B. heartbeat rates
  - C. blood pressures
  - D. red blood cell counts
27. The atrioventricular valves prevent the backflow of blood from the
- A. ventricle into the aorta
  - B. ventricles into the atria
  - C. atria into the ventricles
  - D. atrium into the pulmonary artery
28. The lymphatic system functions to
- A. manufacture erythrocytes
  - B. carry oxygen to the cells
  - C. combat infection and disease
  - D. absorb sugars from the small intestine
29. The flow of lymph through the lymphatic system is accomplished PRIMARILY by
- A. compression of the lymph vessels by surrounding muscles
  - B. the pressure produced by the left ventricle
  - C. the pumping action of lymph nodes
  - D. absorption and gravity

Use the following diagram and table to answer questions 30 and 31.

**A Diagram of a Capillary in a Human Lung**

**Hypothetical Data Based on the Above Diagram**

Data Set	Substance Transferred From X to Y	Substance Transferred From Y to X	Substance Formed in Z	Effects of Transfer in Lung on Blood in Pulmonary Veins
I	CO <sub>2</sub>	O <sub>2</sub>	oxyhemoglobin	oxygen concentration is up
II	CO <sub>2</sub>	O <sub>2</sub>	carbamino-hemoglobin	oxygen concentration is down
III	O <sub>2</sub>	CO <sub>2</sub>	oxyhemoglobin	carbon dioxide concentration is down
IV	O <sub>2</sub>	CO <sub>2</sub>	carbamino-hemoglobin	carbon dioxide concentration is up

30. Low levels of carbon monoxide in inhaled air cause **SIGNIFICANTLY** reduced oxygen levels in the area(s) labelled

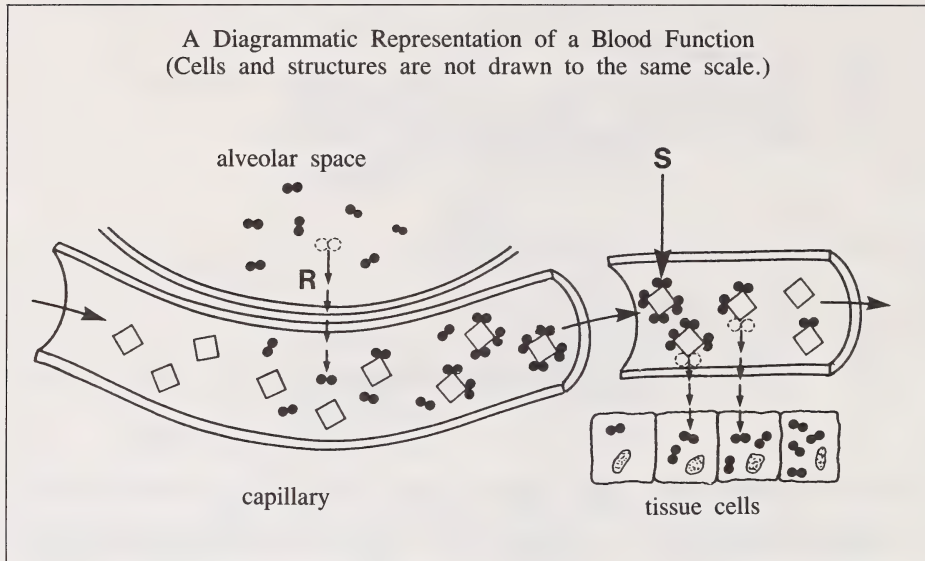
- A. X only
- B. Z only
- C. X and Y
- D. X and Z

31. The data set that **CORRECTLY** illustrates a normally functioning lung is

- A. I
- B. II
- C. III
- D. IV

32. Pneumonia is often characterized by an accumulation of fluid in the lungs. A decrease in the gas exchange rate at the alveoli is caused by an inadequate
- A. gas exchange surface
  - B. blood flow to the lungs
  - C. blood hemoglobin content
  - D. flow of air through the trachea
33. Inhalation is MOST directly a response to
- A. low  $O_2$  concentration
  - B. high  $CO_2$  concentration
  - C. an action of the cerebellum
  - D. a lack of nerve impulses to the diaphragm and muscles of the rib cage
34. After hyperventilating, individuals can hold their breath longer than normal because
- A. the lung capacity has been increased, which allows more air to be taken in
  - B. hyperventilating increases the ability to withstand high concentrations of carbon dioxide
  - C. hyperventilating increases the ability of the mitochondria to respire with lowered levels of oxygen
  - D. most of the carbon dioxide has been removed from the blood, causing a reduction in the number of impulses to the diaphragm
35. A factor that does NOT influence the rate of gas diffusion through the alveolar membrane in the lung is the
- A. thickness of the membrane
  - B. surface area of the membrane
  - C. concentration of carrier molecules in the membrane
  - D. relative concentration of the gases on either side of the membrane

Use the following diagram to answer questions 36 and 37.

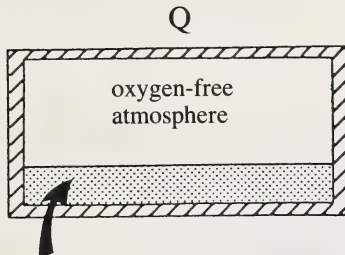


36. The arrows labelled R represent the process of
- A. breathing
  - B. cellular respiration
  - C. diffusion of oxygen molecules
  - D. diffusion of carbon dioxide molecules
37. The structure labelled S represents
- A. carbonic acid
  - B. oxyhemoglobin
  - C. bicarbonate ion
  - D. carbaminohemoglobin
- 
38. The functional efficiency of the circulatory and respiratory systems is improved by physical training. Improvement in athletic performance could therefore be due to
- A. more oxygen and less glucose being supplied to the muscle cells
  - B. more oxygen and more glucose being supplied to the muscle cells
  - C. less oxygen and more lactic acid being supplied to the muscle cells
  - D. less carbon dioxide and less glucose being supplied to the muscle cells

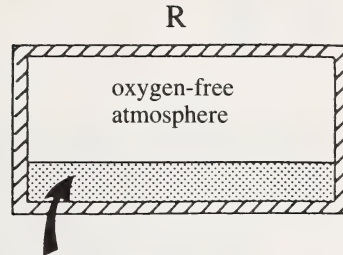


Use the following information to answer questions 39 and 40.

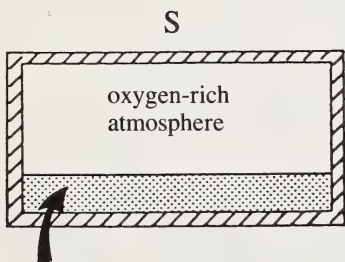
Respiration Experiments



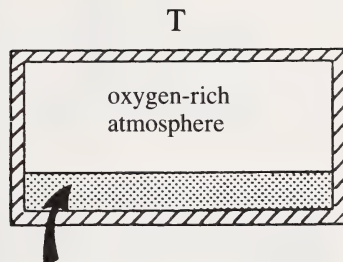
live muscle cells in  
a culture containing  
glucose



live muscle cells in a  
culture lacking glucose



live muscle cells in  
a culture containing  
glucose



live muscle cells in a  
culture lacking glucose

39. Which experiment would produce the GREATEST amount of  $\text{CO}_2$ ?

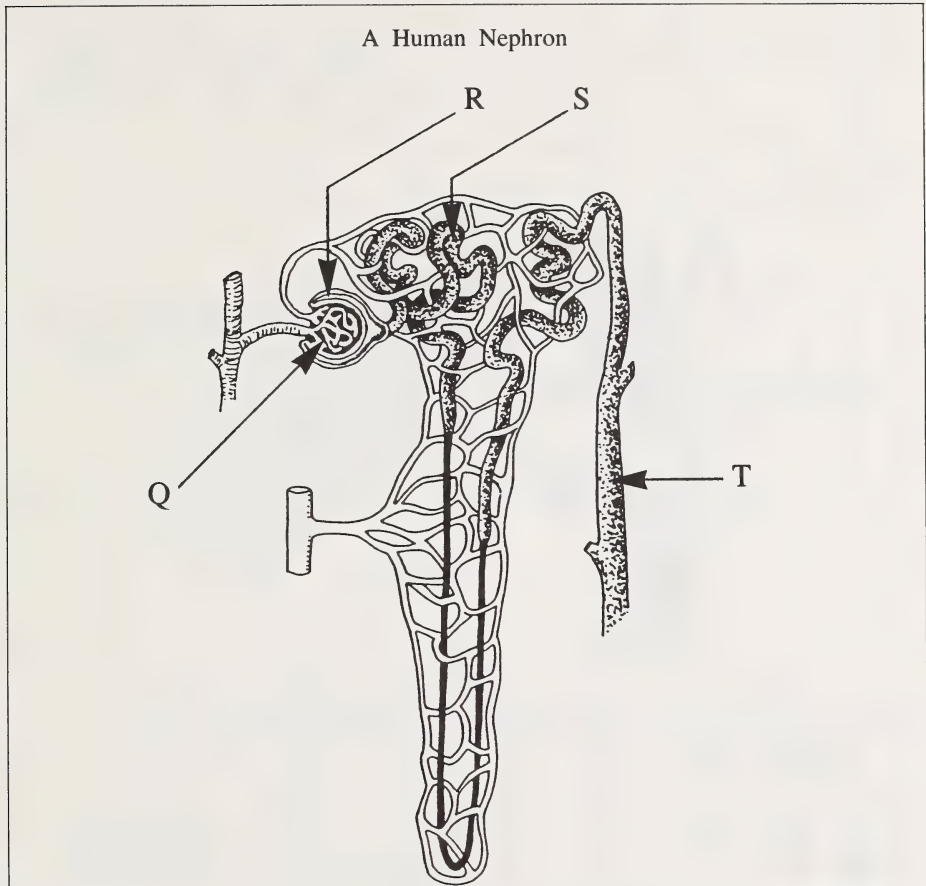
- A. Q
- B. R
- C. S
- D. T

40. Which experiment would produce the GREATEST amount of lactic acid?

- A. Q
- B. R
- C. S
- D. T

41. A compound that releases energy for IMMEDIATE use by cells is
- A. glycogen
  - B. glucose
  - C. ADP
  - D. ATP
42. A mole of glucose yields approximately 2900 kJ of free energy, yet only about 1100 kJ of energy are utilized in the formation of ATP. Most of the remaining energy is
- A. lost as heat
  - B. excreted with body wastes
  - C. used to convert glucose to carbon dioxide and water
  - D. used to increase oxygen absorption into the extracellular fluid
43. A MAJOR function of the kidney is the
- A. deamination of amino acids
  - B. chemical breakdown of urea
  - C. removal of glucose from the blood
  - D. removal of nitrogenous wastes from the blood
44. A patient is diagnosed as suffering from high blood pressure. The physician chooses to treat the patient with a drug that is OPPOSITE in function to antidiuretic hormone (ADH) because the drug will
- A. increase the reabsorption of water, which will lower the blood volume
  - B. decrease the reabsorption of water, which will lower the blood volume
  - C. decrease the reabsorption of water, which will raise the blood volume
  - D. increase the reabsorption of water, which will raise the blood volume
45. Through which sequence of structures does a molecule of urea pass as it is eliminated from the body?
- A. Renal artery → proximal tubule → urethra → ureter
  - B. Renal vein → Bowman's capsule → urethra → ureter
  - C. Bowman's capsule → distal tubule → bladder → urethra
  - D. Glomerulus → loop of Henle → bladder → collecting duct

Use the following diagram to answer question 46.



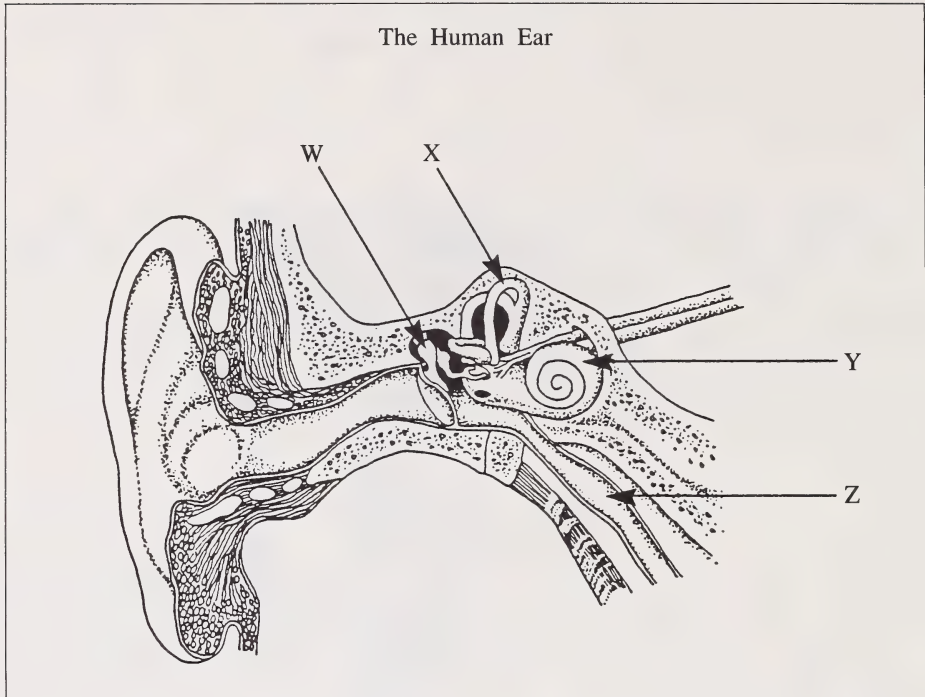
46. The HIGHEST concentration of mitochondria would be expected in the cells of the area labelled

A. Q  
B. R  
C. S  
D. T

47. Changing the focus of the eye for viewing nearby objects to viewing distant objects involves changing the shape of the

A. cornea  
B. pupil  
C. iris  
D. lens

Use the following diagram to answer questions 48 and 49.



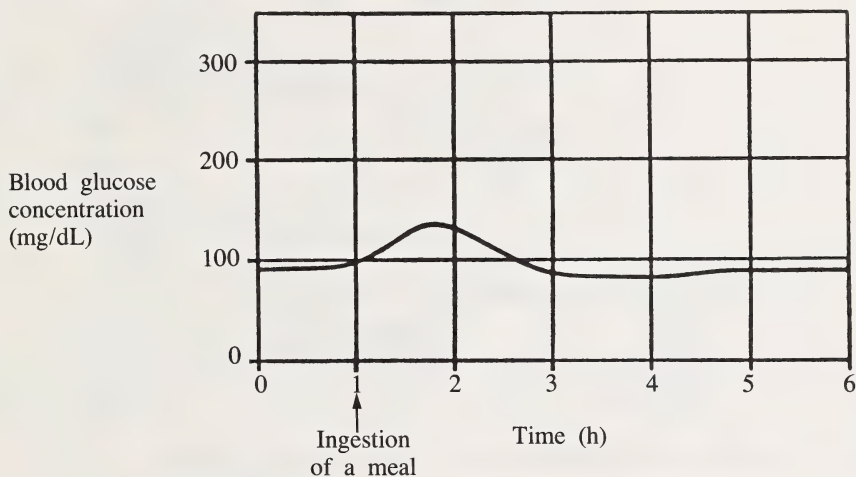
48. The sensory receptors for equilibrium and balance are found in the structure labelled
- A. W
  - B. X
  - C. Y
  - D. Z
49. What is the sequence of structures within the ear through which the normal transmission of sound-wave stimulation occurs?
- A. Tympanic membrane → ossicles → cochlea → auditory nerve
  - B. Auditory nerve → tympanic membrane → cochlea → ossicles
  - C. Cochlea → ossicles → auditory nerve → tympanic membrane
  - D. Auditory canal → cochlea → ossicles → auditory nerve



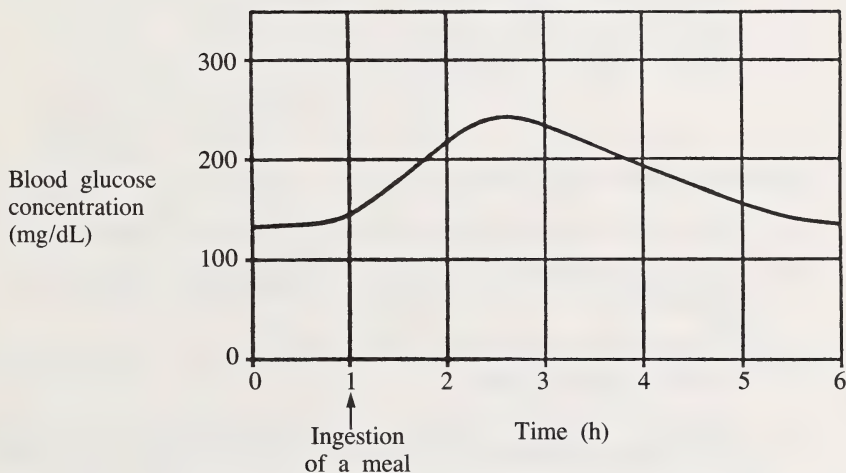
Use the following graphs to answer question 50.

These two graphs show changes in blood glucose concentration in two different persons after they each ingest a meal containing 50 g of glucose. Graph I represents the normal person's blood sugar levels.

Graph I



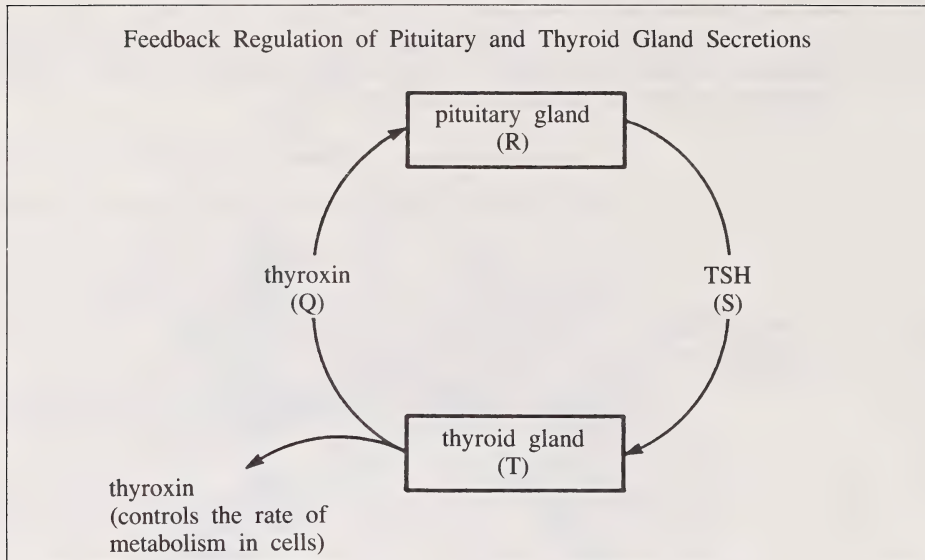
Graph II



50. Correct interpretation of Graph II supports the hypothesis that the second person, following a fast, had

- A. decreased levels of glucagon
- B. increased levels of thyroxine
- C. increased levels of insulin
- D. decreased levels of insulin

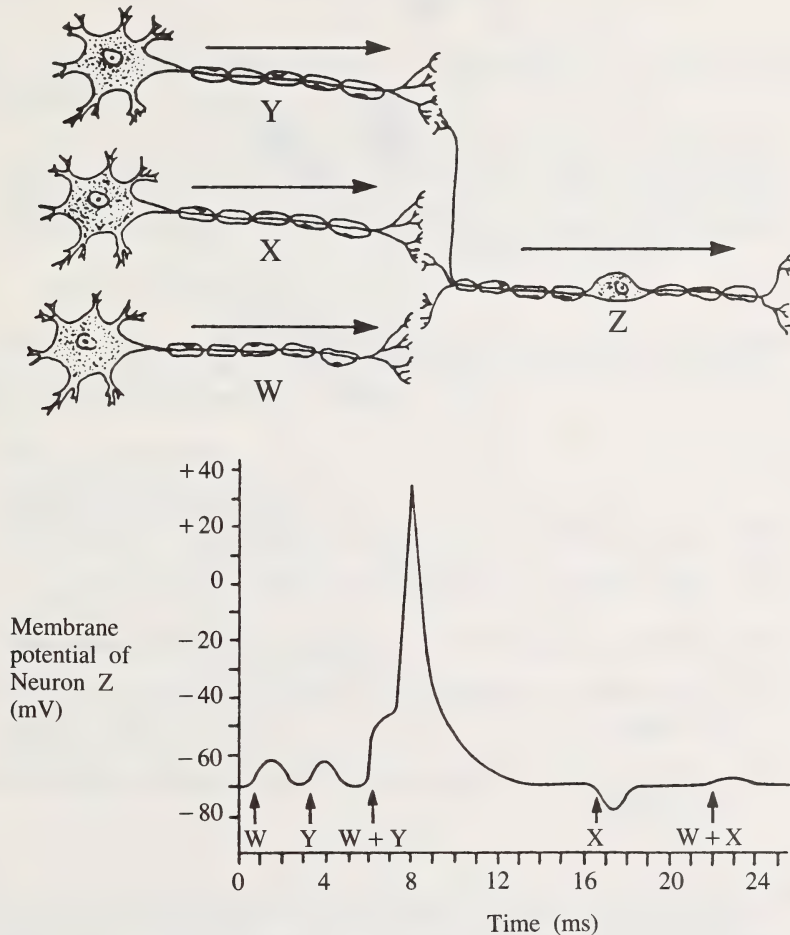
Use the following diagram to answer question 51.



51. A CORRECT interpretation of the diagram is that a higher
- A. metabolic rate in cells induces T to produce more Q
  - B. metabolic rate in cells induces T to produce less Q
  - C. level of Q induces R to produce more S
  - D. level of Q induces R to produce less S
- 
52. A nerve impulse is BEST described as
- A. an electrochemical process that occurs along the neural membrane
  - B. an enzymatic reaction that makes the membrane more permeable to potassium ions
  - C. the diffusion of molecules along the neuron after the molecules have been released from the dendrite
  - D. a result of a change in osmotic pressure between the inner and outer surfaces of the neural membrane
53. The transmission of an impulse across a synapse requires
- A. cholinesterase
  - B. acetylcholine
  - C. sodium ions
  - D. myelin

Use the following information to answer question 54.

An experiment was conducted to examine the relationship of neurons Y, X, and W to Neuron Z. A microelectrode was used to detect the difference in electrical charges between the inside and outside of the cell membrane (membrane potential) of Neuron Z. The graph illustrates the results obtained.

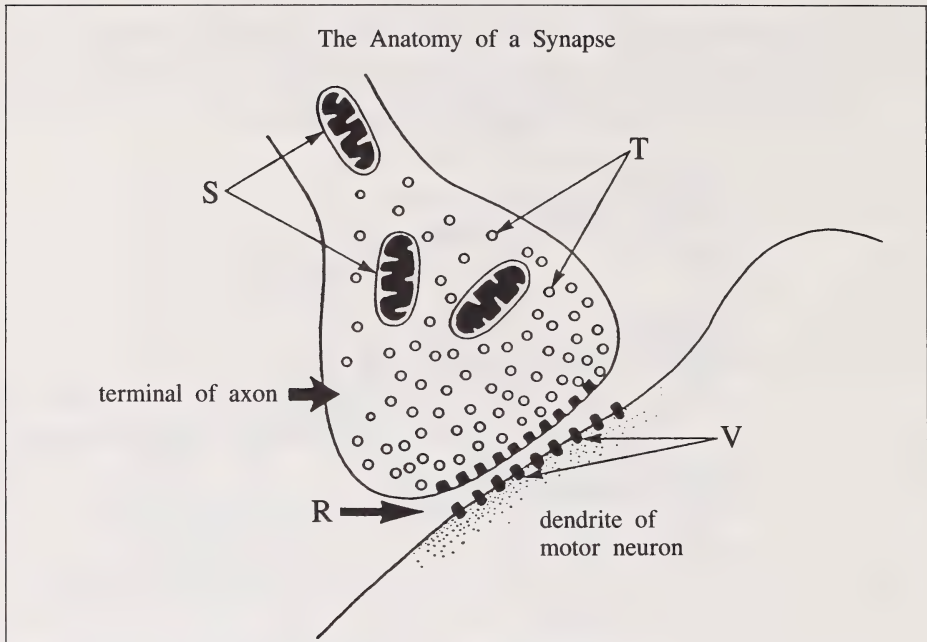


Legend: Long arrows indicate the direction of impulse.  
Short arrows indicate the point in time of stimulation of neurons.

54. In interpreting the graph, a person should infer that neurons

- A. W and X are excitatory; Neuron Y is inhibitory
- B. X and Y are excitatory; Neuron W is inhibitory
- C. W and Y are inhibitory; Neuron X is excitatory
- D. W and Y are excitatory; Neuron X is inhibitory

Use the following diagram to answer questions 55 and 56.



55. The structures labelled S are used for the synthesis of
- A. carrier molecules that transport sodium ions across the synapse
  - B. ATP that is required for the production of transmitter substances
  - C. enzymes that are required for the removal of transmitter substances from the synapse
  - D. ATP that is required for bonding the axon terminal to the receptor sites on the dendrite
56. If large molecules contained in the structures labelled T must pass across the region labelled R in order to bond to structures labelled V for synaptic transmission of nerve impulses to occur, then it can be hypothesized that the terminal of the axon would carry out
- A. phagocytosis
  - B. endocytosis
  - C. exocytosis
  - D. osmosis
-



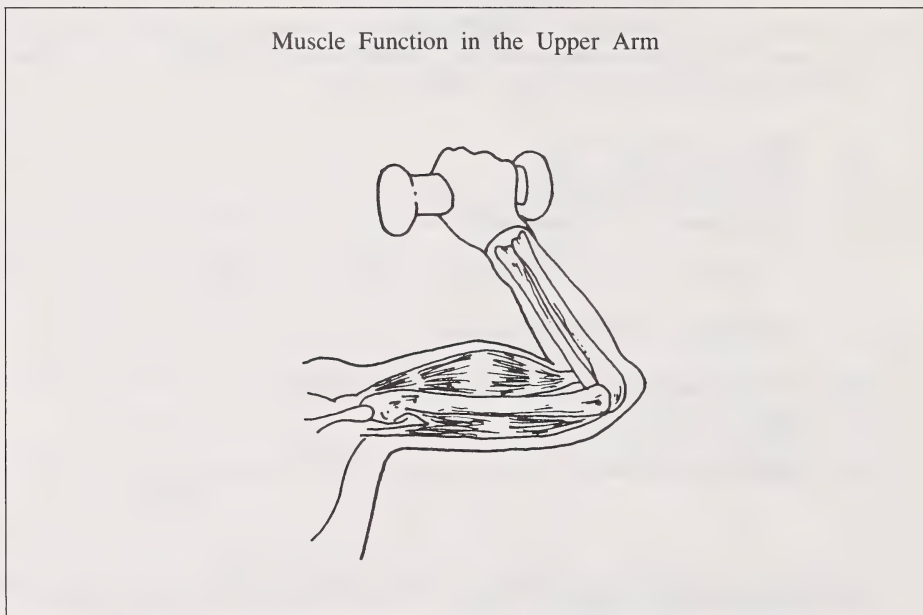
57. Motor neurons transmit impulses
- A. to a sensory neuron
  - B. to a muscle or gland
  - C. from a muscle or gland
  - D. to the motor region of the brain
58. Which sequence lists in CORRECT order the components of a simple reflex arc from “stimulus” to “response”?
- A. Receptor, effector, central nervous system, sensory neuron, motor neuron
  - B. Receptor, sensory neuron, central nervous system, motor neuron, effector
  - C. Receptor, motor neuron, central nervous system, sensory neuron, effector
  - D. Effector, sensory neuron, central nervous system, motor neuron, receptor
59. In response to a sudden loud noise, a person’s heart rate increases, the pupils of the eyes dilate, and the adrenal glands secrete more adrenaline. The nervous system responsible for the body’s reaction is the
- A. central nervous system
  - B. peripheral nervous system
  - C. sympathetic nervous system
  - D. parasympathetic nervous system
60. The function of a tendon is to attach
- A. bone to bone
  - B. muscle to bone
  - C. ligament to bone
  - D. ligament to muscle
61. When muscles are viewed through the light microscope, the striations that appear are caused by the presence of
- A. alternating fat and carbohydrate layers
  - B. protein filaments
  - C. blood vessels
  - D. nerve cells

Use the following information to answer question 62.

Botulism is a form of food poisoning. A bacterium (*Clostridium botulinum*) produces a toxin that prevents the release of acetylcholine from motor nerve fibres. When the toxin is present in the body, muscles, including those responsible for breathing, may be paralysed.

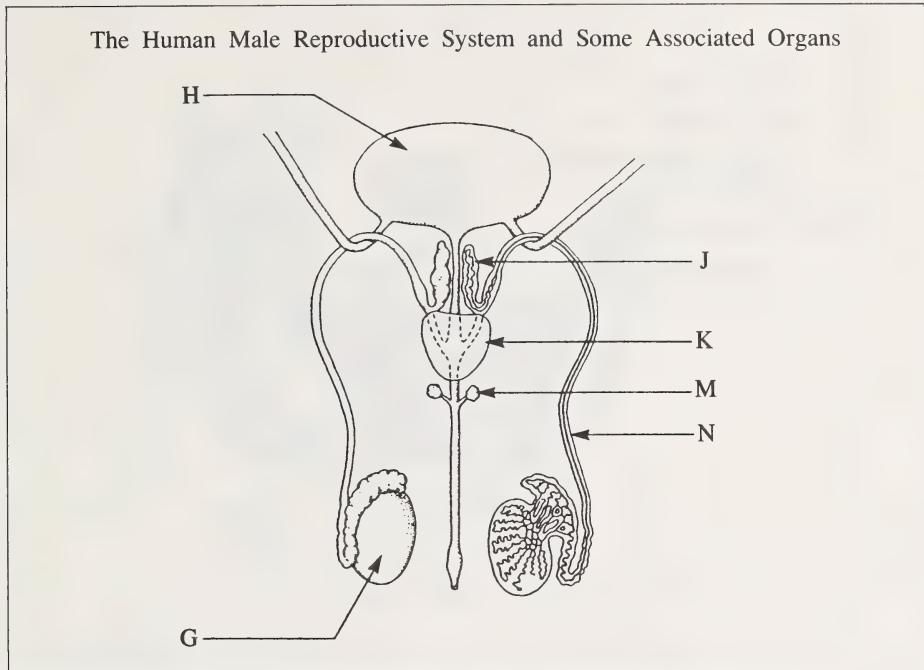
62. The muscular paralysis is caused by the
- A. inhibition of cholinesterase
  - B. inability of actin to react with ATP
  - C. lack of nervous stimulation of muscles
  - D. inability of muscles to relax after contraction
- 

Use the following diagram to answer question 63.



63. If the position illustrated in the diagram were held for a prolonged period of time, what would occur?
- A. Glucose would be converted to glycogen.
  - B. Creatine phosphate would accumulate.
  - C. ATP would be converted to glucose.
  - D. Lactic acid would accumulate.
-

Use the following diagram to answer question 64.



64. Which two structures secrete alkaline substances into semen, thus raising the pH of the sperm's environment?

- A. G and N
- B. H and J
- C. J and K
- D. M and N

Read the following information and then answer question 65.

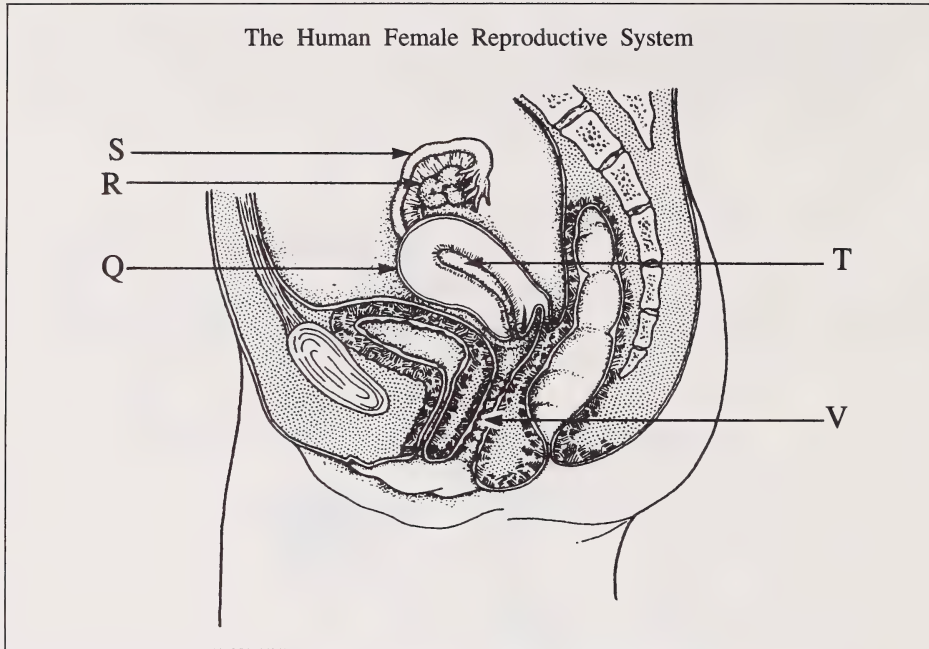
How a Sexually Transmitted Disease Affects Male Reproduction

An infection in the vas deferens of each testis may render a male infertile. Even though sperm production continues in the \_\_\_\_, sperm are unable to enter the \_\_\_\_.

65. Which sequence of words would CORRECTLY complete the sentence?

- A. Testes, ureter
- B. Testes, urethra
- C. Vas deferens, ureter
- D. Vas deferens, urethra

Use the following diagram to answer questions 66 and 67.



66. The structure in the female that carries out a similar function to the vas deferens in the male is labelled

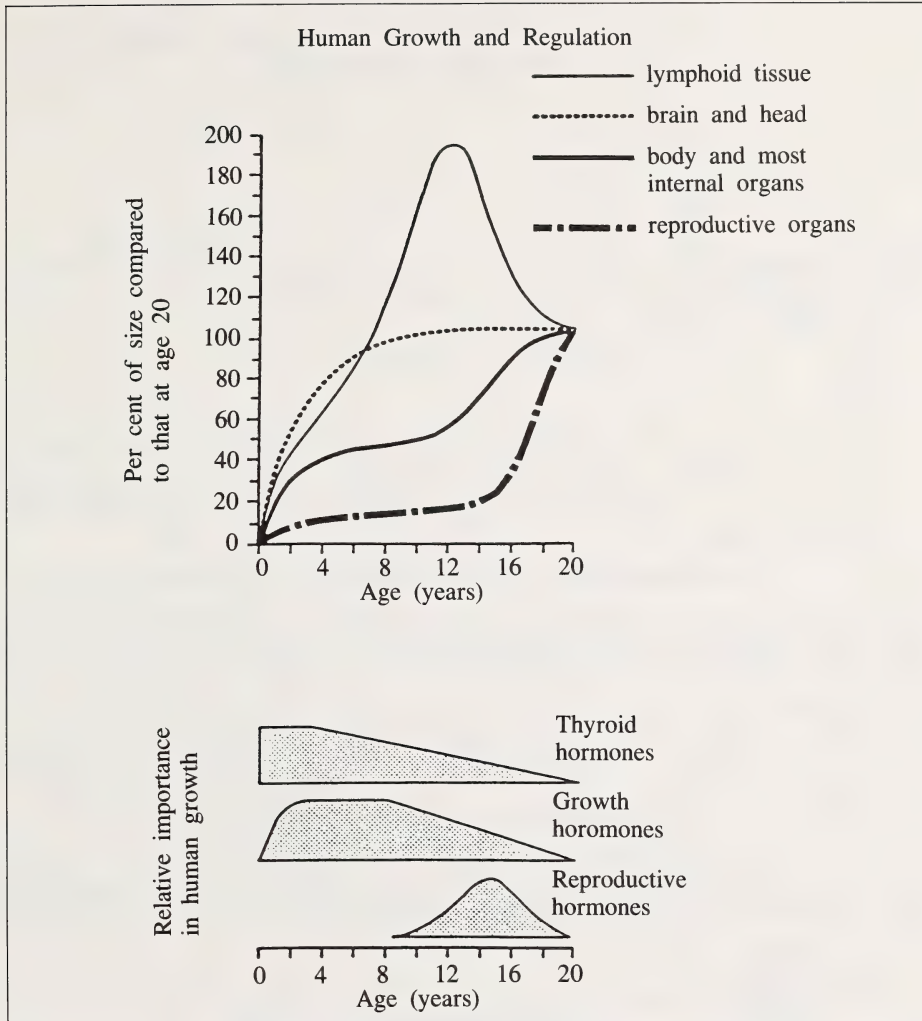
- A. Q
- B. R
- C. S
- D. V

67. The sequence of egg maturation and fertilization RESPECTIVELY occurs in the regions labelled

- A. R and Q
  - B. R and S
  - C. S and R
  - D. S and T
-

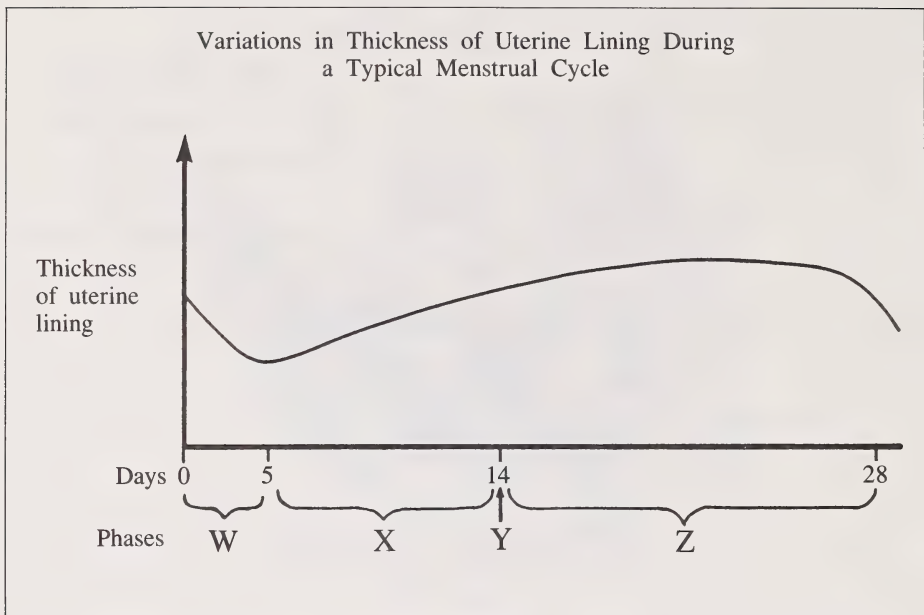


Use the following graphs to answer question 68.



68. Which interpretation is BEST supported by the data obtained from the graphs?
- The growth “spurt” of adolescence is primarily due to increased levels of reproductive hormones.
  - Reproductive organs must become mature before sex hormones can be produced in the body.
  - Lymphoid tissue is used to form reproductive organs during adolescence.
  - The function of the brain is NOT affected by reproductive hormones.

Use the following graph to answer question 69.



69. During which phase does menstruation occur?

- A. W
  - B. X
  - C. Y
  - D. Z
- 

70. The human birth process involves a rupturing of the

- A. uterus
- B. follicle
- C. amnion
- D. umbilical cord

**YOU HAVE NOW COMPLETED THE MULTIPLE-CHOICE SECTION OF THE EXAMINATION. PLEASE PROCEED TO THE NEXT PAGE AND ANSWER THE WRITTEN-RESPONSE QUESTIONS IN PART B.**

## **PART B**

### **INSTRUCTIONS**

Please write your answers in the examination booklet as neatly as possible.

Communicate your answers in clear, concise sentences. Marks will be awarded for pertinent explanations and answers.

<p>NOTE: The perforated pages at the back of this booklet may be torn out and used for your rough work.</p>
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**TOTAL MARKS: 30**

**START PART B IMMEDIATELY**

**(5 marks)**

**1. a.** Compare mechanical (physical) digestion with chemical digestion.

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**b.** Explain how mechanical digestion of food assists chemical digestion.

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**c.** Whole wheat bread contains both cellulose and starch. In the human digestive system, starch is digested whereas cellulose is not, yet both are valuable for healthy nutrition. Explain the role of both starch and cellulose in human nutrition.

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(5 marks)

2. An experiment was carried out to test the effect of changes in pH on the function of the enzyme catalase. In the experiment, catalase was used to decompose a common substrate at pH levels of 3, 5, 7, 9, and 11. From the data collected, it was concluded that catalase functions best at a neutral pH.

- a. Sketch and label a graph to show the rate of reaction for the experiment.



- b. Suppose a chemical pollutant that is known to denature proteins contaminated the materials used in the above experiment. How would the results of the experiment be affected? Support your answer with an explanation.

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**Use the following information to answer question 3.**

Four patients were admitted to a hospital to undergo various tests. The following data were collected from an analysis of their urine samples:

Substance Measured in Urine	Relative Amounts Found in Each Patient's Urine Sample				
	Normal Person	Patient 1	Patient 2	Patient 3	Patient 4
Blood	none	moderate	none	none	none
Glucose	none to trace	trace	trace	none	moderate
Ketones*	none	trace	trace	none	moderate
Potassium	none to moderate	trace	moderate	trace	trace
Proteins	none to trace	large	none	trace	none
Sodium	moderate to large	large	large	large	moderate
Urea	moderate to large	moderate	moderate	moderate	large

\*Ketones are substances formed in the liver when fat instead of carbohydrate is the main fuel.

**(6 marks)**

3. Based on these results, a physician suspects one patient is suffering from decreased insulin production and another patient from a kidney disease.

Predict which patient is suffering from

- decreased insulin production
- kidney disease

Support your predictions by explaining the relationship of at least TWO substance measurements to each disease. Respond on the NEXT PAGE using complete sentences.

**a. Decreased Insulin Production:**

Patient Number \_\_\_\_\_

Explanation \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
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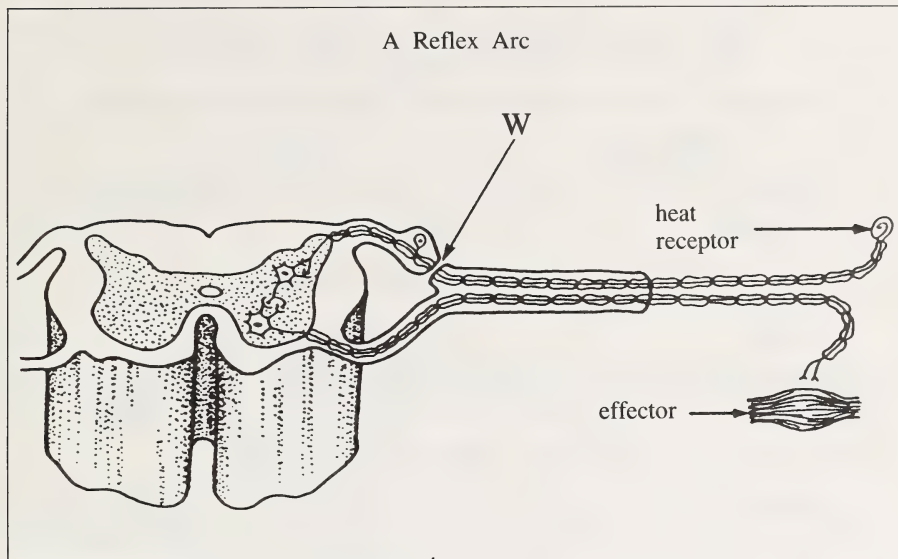
**b. Kidney Disease:**

Patient Number \_\_\_\_\_

Explanation \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_



Use the following diagram to answer question 5.



5. a. An individual's neural pathway is severed at the location labelled W. How would this damage affect a person's detection of heat and the ability to respond?

(4 marks)

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- b. In the laboratory, a student whose reflex arc was NOT severed burned a finger in the flame of a bunsen burner. The student pulled the injured hand away with a quick jerk and then cried, "Ouch!" Why did the action of removing the finger from the flame happen before the student consciously experienced the injury?

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Use the following table to answer question 6.

Effects of the Sympathetic Nervous System on Three Parts of the Body	
Body Part	Response
Bronchi	Dilation
Digestive system	Decreased peristalsis
Liver	Increased conversion of glycogen to glucose

(3 marks)

6. How would each response aid a person in an emergency?

- a. Dilation \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
- b. Decreased peristalsis \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
- c. Increased conversion of glycogen to glucose \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

7. a. Describe the conditions that would cause an Rh-negative pregnant woman to become sensitized to the Rh factor of the fetus she is carrying.

**(3 marks)**

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- b. If a woman became sensitized to the Rh factor during her first pregnancy, explain why this condition could cause problems for a fetus during the woman's second pregnancy.

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**YOU HAVE NOW COMPLETED THE EXAMINATION. IF YOU HAVE TIME,  
YOU MAY WISH TO GO BACK AND CHECK YOUR ANSWERS.**



(NO MARKS WILL BE GIVEN FOR WORK DONE ON THIS PAGE)

FOLD AND TEAR ALONG PERFORATION





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FOLD AND TEAR ALONG PERFORATION





## M1

M2



M3

M4



## BIOLOGY 30

(LAST NAME)

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**(FIRST NAME)**

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M  
D[illegible]

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## BIOLOGY 30